



# Vertical Accuracy Report

Wisconsin WROC - 3DEP 2020

Grant County Lidar

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# Vertical Accuracy Report

## Project Information

Prepared By: Ayres

Project Name: Wisconsin WROC – 3DEP Grant County Lidar 2020

Sensor Info: Riegl 1560

Required Nominal Pulse Spacing: 0.7

Consultant Name: Ayres primary and Quantum Spatial (now NV5 Geospatial) as lidar acquisition partner

Units: U.S. Survey Feet

Date of Acquisition: Start: 4/19/2020 | Finish: 4/30/2020

## Report Information

This report documents the absolute vertical accuracy of the lidar data collected for the Grant County, WI, QL2 lidar project. Independent vertical checkpoints were collected by land surveyors using Trimble GNSS equipment connected to WISCRS base stations. The checkpoints were collected from April 13 to April 14, 2020.

The checkpoints were collected under various land cover types that are predominant in the County. Each land cover type falls into either the Non-vegetated Vertical Accuracy (NVA) or the Vegetated Vertical Accuracy (VVA) group. For this project, 70 NVA points and 55 VVA points were collected throughout the County.

The following report shows the final statistics for the NVA checkpoints compared against the raw swath point cloud and the bare earth DEM, and the VVA statistics compared against the DEM. Statistics are reported for LAS and DEM by NVA and VVA categories.

Vertical Accuracy Specifications per USGS QL2 level:

### LAS:

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

### DEM:

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

VVA equates to 29.4 cm (0.96 ft) at the 95th percentile.

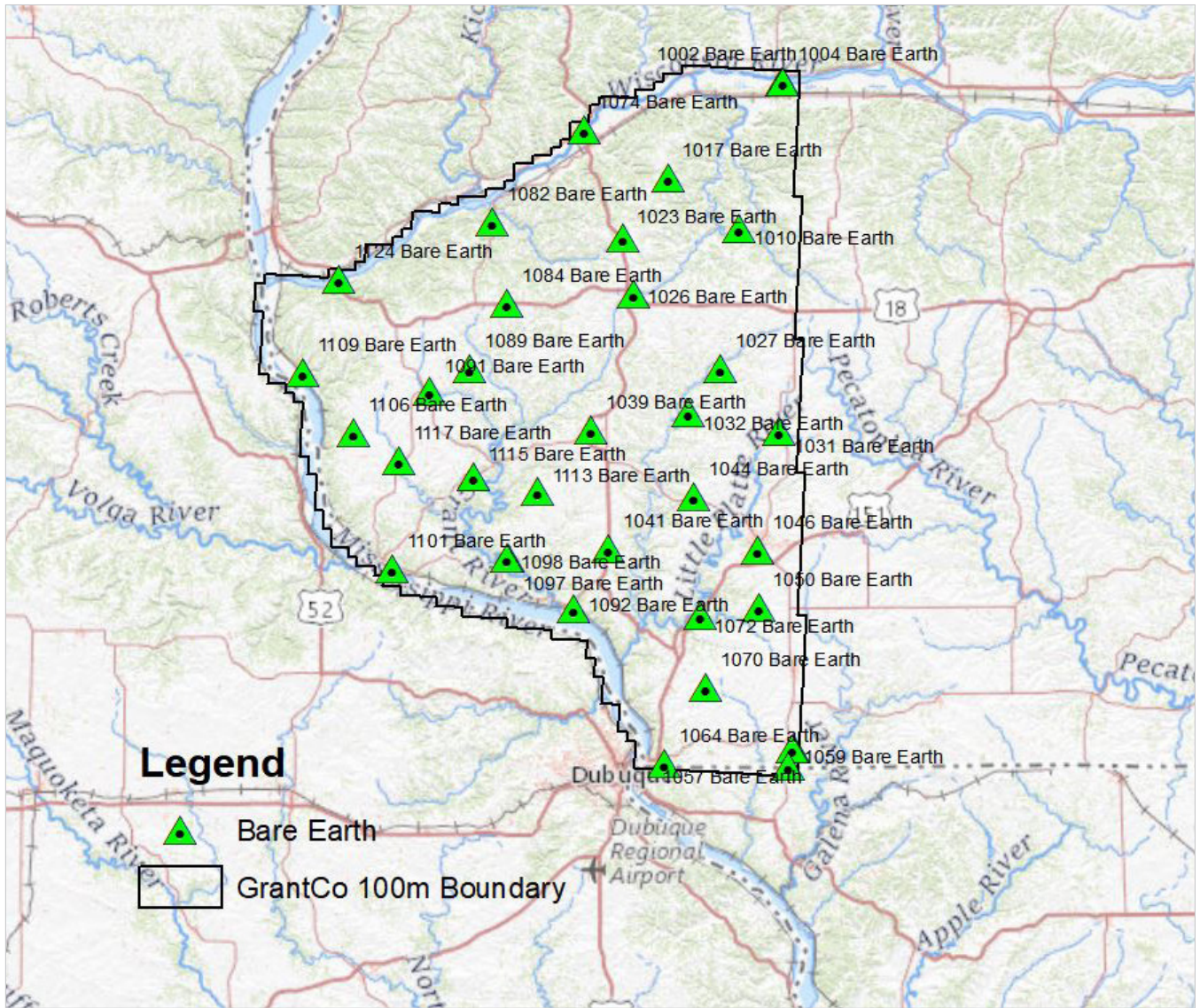
The NVA and VVA statistics for this project are within the above stated specifications.

## Lidar Accuracy Assessment Summary

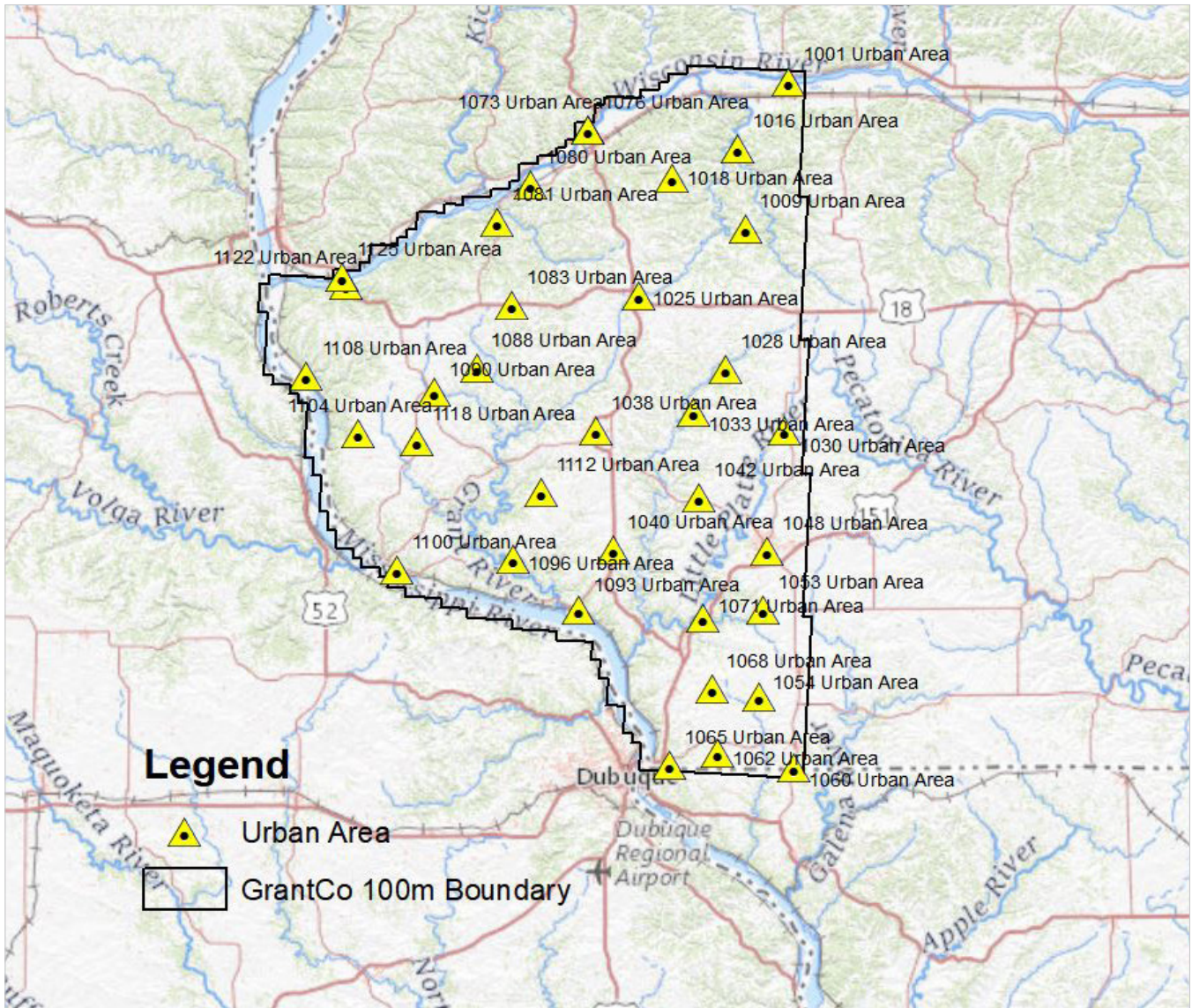
LAND COVER TYPE	# OF POINTS	NVA	VVA
<b>LAS</b>		<b>95% confidence</b>	
Bare Earth	35	0.204	N/A
Urban Area	35	0.187	N/A
Forest	25	N/A	N/A
Tall Weeds	30	N/A	N/A
<b>Total</b>	<b>125</b>	<b>0.196</b>	<b>N/A</b>
<b>DEM</b>		<b>95% confidence</b>	<b>95th percentile</b>
Bare Earth	35	0.185	N/A
Urban Area	35	0.159	N/A
Forest	25	N/A	0.415
Tall Weeds	30	N/A	0.589
<b>Total</b>	<b>125</b>	<b>0.172</b>	<b>0.449</b>

Units: U.S. Survey Feet

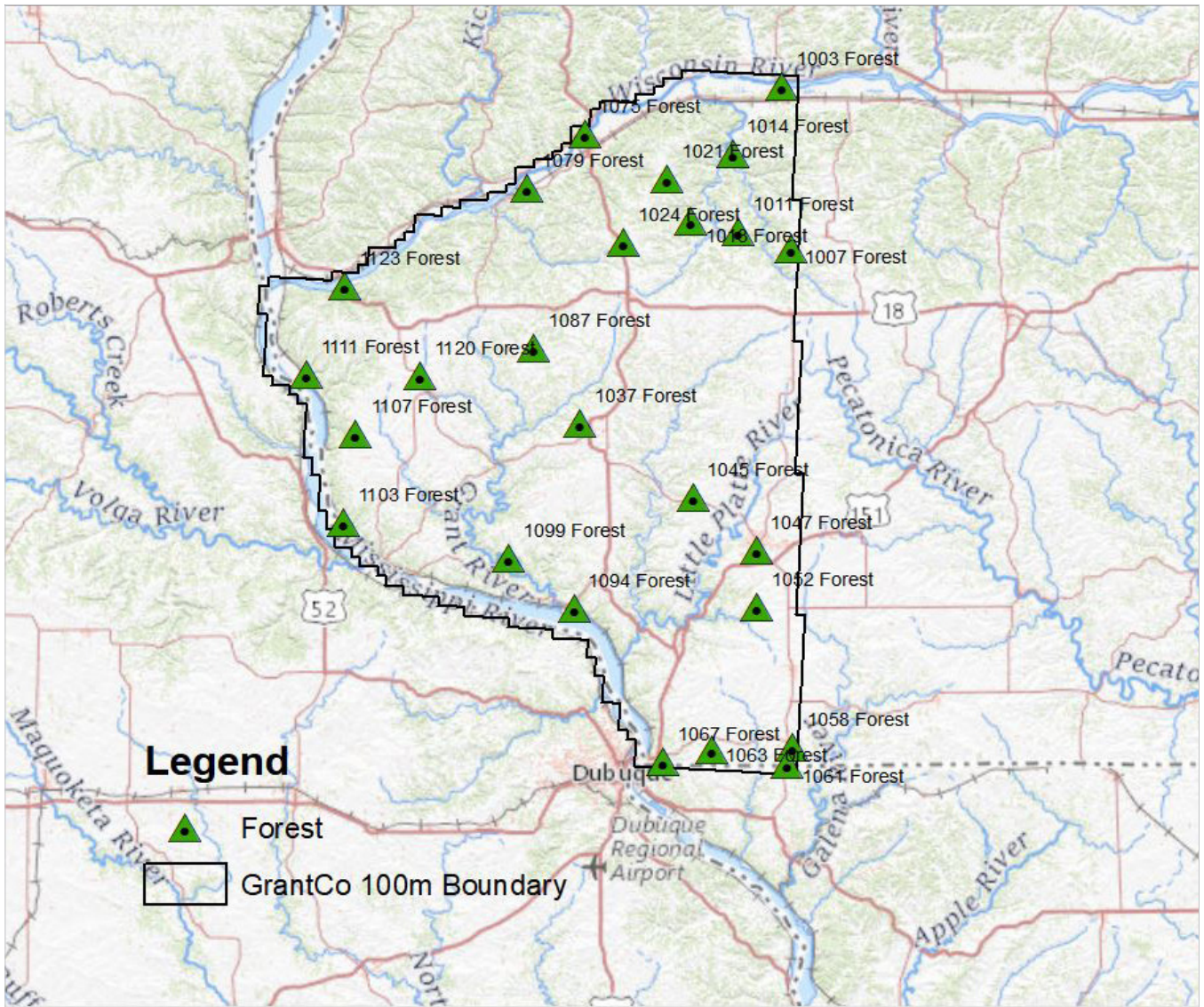
## Map of NVA Checkpoint Locations - Bare Earth



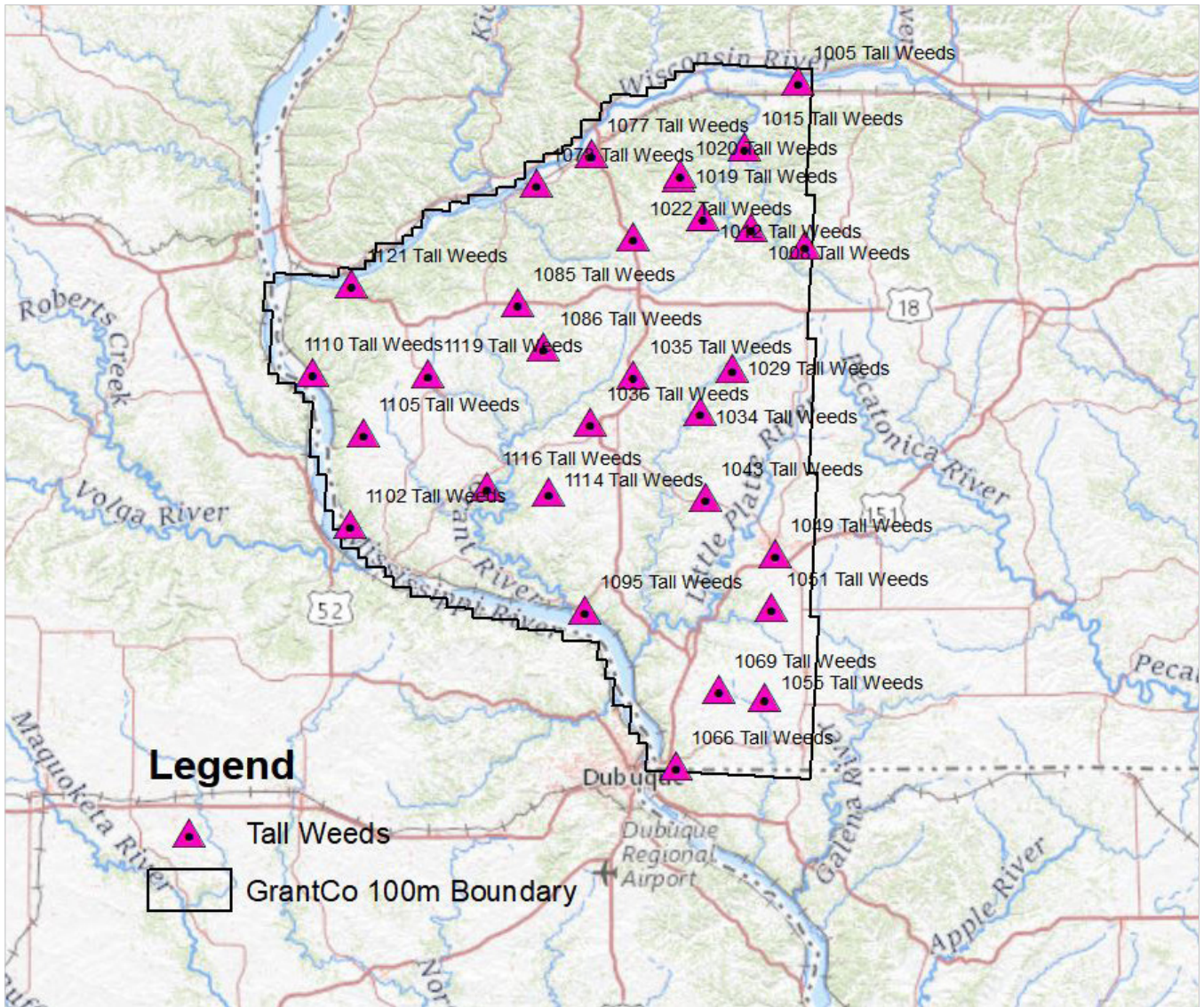
## Map of NVA Checkpoint Locations - Urban Areas



## Map of NVA Checkpoint Locations - Forested Areas



## Map of NVA Checkpoint Locations - Tall Weeds



## LAS

NONVEGETATED VERTICAL ACCURACY – OVERALL	
LAND COVER TYPE	BARE EARTH, URBAN AREA
Minimum DZ	-0.231
Maximum DZ	0.259
Mean DZ	-0.006
Mean Magnitude DZ	0.285
Number Observations	70
Standard Deviation DZ	0.1
RMSE Z	0.1
95% Confidence Level Z	0.196
Units	U.S. Survey Feet

## DEM

NONVEGETATED VERTICAL ACCURACY	
LAND COVER TYPE	BARE EARTH, URBAN AREA
Minimum DZ	-0.246
Maximum DZ	0.261
Mean DZ	0.007
Mean Magnitude DZ	0.259
Number Observations	70
Standard Deviation DZ	0.088
RMSE Z	0.088
95% Confidence Level Z	0.172
Units	U.S. Survey Feet



## DEM (Continued)

VEGETATED VERTICAL ACCURACY	
LAND COVER TYPE	FOREST
Minimum DZ	-0.103
Maximum DZ	0.429
Mean DZ	0.158
Mean Magnitude DZ	0.423
Number Observations	25
Standard Deviation DZ	0.156
RMSE Z	0.22
95th percentile	0.415
Units	U.S. Survey Feet

VEGETATED VERTICAL ACCURACY	
LAND COVER TYPE	TALL WEEDS
Minimum DZ	0.021
Maximum DZ	0.801
Mean DZ	0.277
Mean Magnitude DZ	0.526
Number Observations	30
Standard Deviation DZ	0.155
RMSE Z	0.316
95th percentile	0.589
Units	U.S. Survey Feet

# Point: 1001 Urban Area

Survey X: 890861.95, Survey Y: 650877.61, Z1: 681.57, Z DEM: 681.58, Z LAS: 681.59, ΔZ DEM: 0.01, ΔZ LAS: 0.02



North



South



East



West

# Point: 1002 Bare Earth

Survey X: 890738.2, Survey Y: 651104.41, Z1: 678.55, Z DEM: 678.65, Z LAS: 678.71, ΔZ DEM: 0.1, ΔZ LAS: 0.15



North



South



East



West

# Point: 1003 Forested

Survey X: 890944.62, Survey Y: 650931.49, Z1: 681.87, Z DEM: 681.88, Z LAS: 681.88, ΔZ DEM: 0.01, ΔZ LAS: 0.01



North



South



East



West

# Point: 1004 Bare Earth

Survey X: 890898.34, Survey Y: 650709.97, Z1: 681.19, Z DEM: 681.18, Z LAS: 681.15, ΔZ DEM: -0.01, ΔZ LAS: -0.04



North



South



East



West

# Point: 1005 Tall Weeds

Survey X: 891995.84, Survey Y: 650665.04, Z1: 683.5, Z DEM: 683.81, Z LAS: 683.87, ΔZ DEM: 0.32, ΔZ LAS: 0.37



North



South



East



West

# Point: 1006 Tall Weeds

Survey X: 894223.15, Survey Y: 590722.46, Z1: 1109.71, Z DEM: 1109.98, Z LAS: 1110.06, ΔZ DEM: 0.26, ΔZ LAS: 0.35



North



South



East



West

# Point: 1007 Forested

Survey X: 894274.02, Survey Y: 590606.54, Z1: 1114.82, Z DEM: 1115.25, Z LAS: 1115.16, ΔZ DEM: 0.43, ΔZ LAS: 0.33



North



South



East



West



# Point: 1008 Tall Weeds

Survey X: 874985.42, Survey Y: 596964.9, Z1: 1121.86, Z DEM: 1122.03, Z LAS: 1122.14, ΔZ DEM: 0.17, ΔZ LAS: 0.28



North



South



East



West

# Point: 1009 Urban Area

Survey X: 875129.84, Survey Y: 596943.13, Z1: 1127.16, Z DEM: 1127.2, Z LAS: 1127.19, ΔZ DEM: 0.03, ΔZ LAS: 0.03



North



South



East



West

# Point: 1010 Bare Earth

Survey X: 875027.09, Survey Y: 597023.41, Z1: 1122.06, Z DEM: 1122.16, Z LAS: 1122.19, ΔZ DEM: 0.11, ΔZ LAS: 0.13



North



South



East



West

# Point: 1011 Forested

Survey X: 874910.88, Survey Y: 597013.96, Z1: 1114.26, Z DEM: 1114.63, Z LAS: 1114.73, ΔZ DEM: 0.37, ΔZ LAS: 0.47



North



South



East



West

# Point: 1012 Tall Weeds

Survey X: 857407.11, Survey Y: 600795.39, Z1: 1090.06, Z DEM: 1090.29, Z LAS: 1090.32, ΔZ DEM: 0.23, ΔZ LAS: 0.26



North



South



East



West

# Point: 1013 Forested

Survey X: 857295.13, Survey Y: 600814.39, Z1: 1096.32, Z DEM: 1096.66, Z LAS: 1096.67, ΔZ DEM: 0.35, ΔZ LAS: 0.36



North



South



East



West

# Point: 1014 Forested

Survey X: 872670.16, Survey Y: 626070.12, Z1: 735.23, Z DEM: 735.64, Z LAS: 735.69, ΔZ DEM: 0.41, ΔZ LAS: 0.46



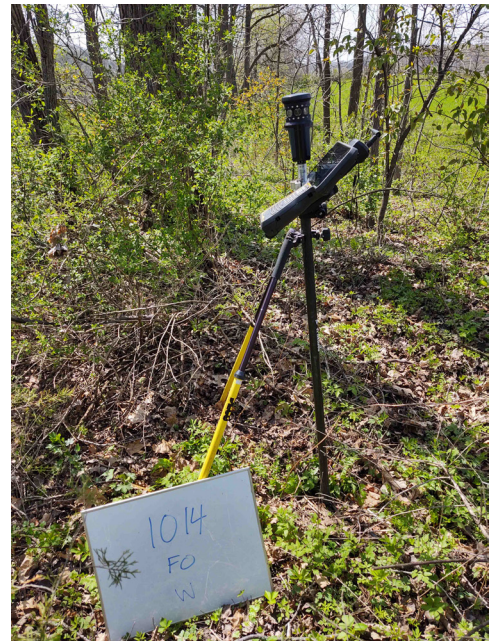
North



South



East



West

# Point: 1015 Tall Weeds

Survey X: 872566.67, Survey Y: 626266.88, Z1: 717.53, Z DEM: 717.75, Z LAS: 717.71, ΔZ DEM: 0.22, ΔZ LAS: 0.18



North



South



East



West



# Point: 1016 Urban Area

Survey X: 872562.83, Survey Y: 626409.04, Z1: 710.77, Z DEM: 710.87, Z LAS: 710.88,  $\Delta Z$  DEM: 0.11,  $\Delta Z$  LAS: 0.12



North



South



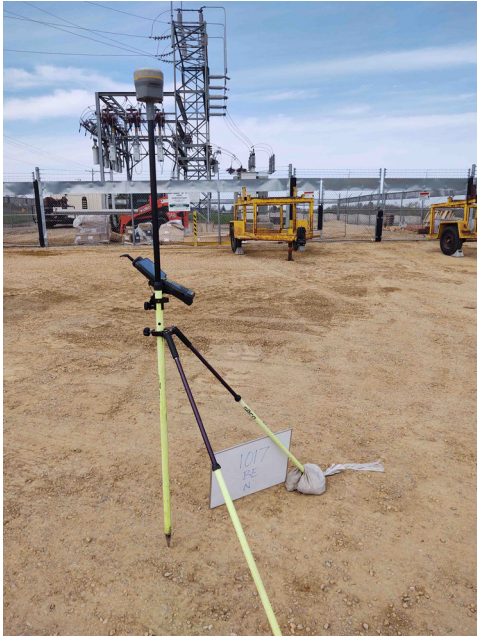
East



West

# Point: 1017 Bare Earth

Survey X: 848699.05, Survey Y: 615503.76, Z1: 1118.52, Z DEM: 1118.54, Z LAS: 1118.57, ΔZ DEM: 0.02, ΔZ LAS: 0.06



North



South



East



West

# Point: 1018 Urban Area

Survey X: 848578.36, Survey Y: 615476.19, Z1: 1119.03, Z DEM: 1119.15, Z LAS: 1119.13, ΔZ DEM: 0.12, ΔZ LAS: 0.1



North



South



East



West

# Point: 1019 Tall Weeds

Survey X: 848595.59, Survey Y: 615408.78, Z1: 1116.61, Z DEM: 1116.96, Z LAS: 1116.81, ΔZ DEM: 0.35, ΔZ LAS: 0.2



North



South



East



West

## Point: 1020 Tall Weeds

Survey X: 848712.16, Survey Y: 616873.41, Z1: 1113.65, Z DEM: 1113.91, Z LAS: 1113.96, ΔZ DEM: 0.26, ΔZ LAS: 0.31



North



South



East



West

# Point: 1021 Forested

Survey X: 848508.77, Survey Y: 616834.74, Z1: 1117.12, Z DEM: 1117.47, Z LAS: 1117.12, ΔZ DEM: 0.35, ΔZ LAS: 0.01



North



South



East



West

# Point: 1022 Tall Weeds

Survey X: 831983.89, Survey Y: 593507.62, Z1: 1226.31, Z DEM: 1226.63, Z LAS: 1226.61, ΔZ DEM: 0.32, ΔZ LAS: 0.31



North



South



East



West

# Point: 1023 Bare Earth

Survey X: 832092.28, Survey Y: 593478.36, Z1: 1230.1, Z DEM: 1230.15, Z LAS: 1230.09, ΔZ DEM: 0.05, ΔZ LAS: -0.01



North



South



East



West



# Point: 1024 Forested

Survey X: 832268.83, Survey Y: 593299.65, Z1: 1228.98, Z DEM: 1229.06, Z LAS: 1229, ΔZ DEM: 0.08, ΔZ LAS: 0.02



North



South



East



West

# Point: 1025 Urban Area

Survey X: 835963.16, Survey Y: 572757.77, Z1: 1185.99, Z DEM: 1185.97, Z LAS: 1186.05, ΔZ DEM: -0.02, ΔZ LAS: 0.06



North



South



East



West

# Point: 1026 Bare Earth

Survey X: 835974.47, Survey Y: 573044.14, Z1: 1197.79, Z DEM: 1197.79, Z LAS: 1197.76, ΔZ DEM: 0, ΔZ LAS: -0.03



North



South



East



West

## Point: 1027 Bare Earth

Survey X: 868195.4, Survey Y: 545582.55, Z1: 1052.03, Z DEM: 1052.01, Z LAS: 1051.94,  $\Delta Z$  DEM: -0.02,  $\Delta Z$  LAS: -0.09



North



South



East



West

## Point: 1028 Urban Area

Survey X: 868155.34, Survey Y: 545529.34, Z1: 1050.78, Z DEM: 1050.73, Z LAS: 1050.7,  $\Delta Z$  DEM: -0.05,  $\Delta Z$  LAS: -0.08



North



South



East



West

# Point: 1029 Tall Weeds

Survey X: 868021.32, Survey Y: 545536.18, Z1: 1040.81, Z DEM: 1041.26, Z LAS: 1041.32, ΔZ DEM: 0.45, ΔZ LAS: 0.51



North



South



East



West

# Point: 1030 Urban Area

Survey X: 889677.84, Survey Y: 523050.67, Z1: 947.03, Z DEM: 947.03, Z LAS: 947.03, ΔZ DEM: 0, ΔZ LAS: -0.01



North



South



East



West

# Point: 1031 Bare Earth

Survey X: 889685.56, Survey Y: 522723.71, Z1: 943.82, Z DEM: 943.87, Z LAS: 943.87, ΔZ DEM: 0.05, ΔZ LAS: 0.05



North



South



East



West



# Point: 1032 Bare Earth

Survey X: 856305.68, Survey Y: 529642.76, Z1: 1036.72, Z DEM: 1036.72, Z LAS: 1036.67, ΔZ DEM: 0, ΔZ LAS: -0.06



North



South



East



West

# Point: 1033 Urban Area

Survey X: 856345.07, Survey Y: 529840.6, Z1: 1043.21, Z DEM: 1043.17, Z LAS: 1043.08, ΔZ DEM: -0.04, ΔZ LAS: -0.13



North



South



East



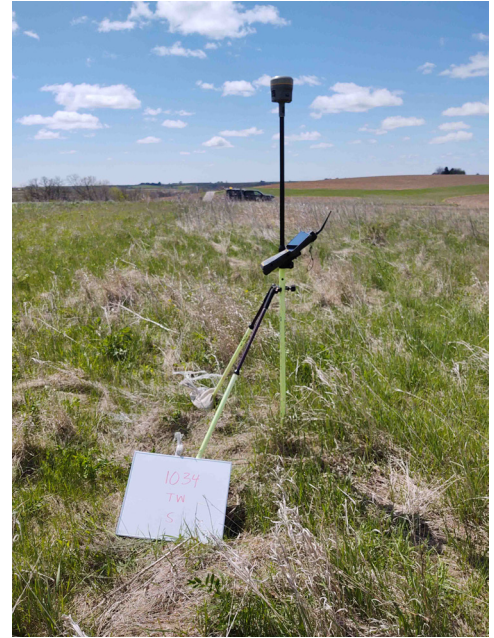
West

# Point: 1034 Tall Weeds

Survey X: 856292.62, Survey Y: 529839.19, Z1: 1039.06, Z DEM: 1039.41, Z LAS: 1039.29, ΔZ DEM: 0.36, ΔZ LAS: 0.23



North



South



East



West

# Point: 1035 Tall Weeds

Survey X: 831877.96, Survey Y: 543169.21, Z1: 1137.35, Z DEM: 1137.64, Z LAS: 1137.61, ΔZ DEM: 0.29, ΔZ LAS: 0.26



North



South



East



West

# Point: 1036 Tall Weeds

Survey X: 816205.1, Survey Y: 525918.83, Z1: 1062.51, Z DEM: 1062.71, Z LAS: 1062.75, ΔZ DEM: 0.2, ΔZ LAS: 0.24



North



South



East



West

# Point: 1037 Forested

Survey X: 816251.78, Survey Y: 526144.85, Z1: 1042, Z DEM: 1041.94, Z LAS: 1042.05, ΔZ DEM: -0.06, ΔZ LAS: 0.05



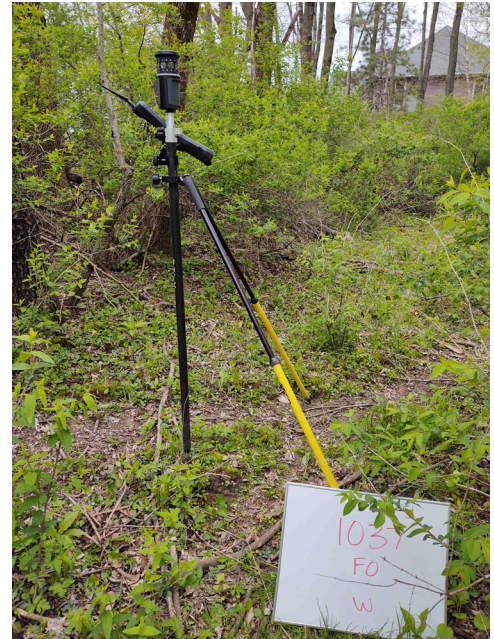
North



South



East



West

# Point: 1038 Urban Area

Survey X: 820588.5, Survey Y: 523243.78, Z1: 1033.48, Z DEM: 1033.54, Z LAS: 1033.58, ΔZ DEM: 0.06, ΔZ LAS: 0.1



North



South



East



West

# Point: 1039 Bare Earth

Survey X: 820762.92, Survey Y: 523073.8, Z1: 1033.05, Z DEM: 1033.18, Z LAS: 1033.14, ΔZ DEM: 0.13, ΔZ LAS: 0.09



North



South



East



West



# Point: 1040 Urban Area

Survey X: 826716.88, Survey Y: 479416.43, Z1: 931.27, Z DEM: 931.26, Z LAS: 931.33, ΔZ DEM: 0, ΔZ LAS: 0.07



North



South



East



West

# Point: 1041 Bare Earth

Survey X: 826775.31, Survey Y: 479416.96, Z1: 929.13, Z DEM: 929.12, Z LAS: 929.13, ΔZ DEM: -0.01, ΔZ LAS: 0



North



South



East



West

# Point: 1042 Urban Area

Survey X: 858263.74, Survey Y: 498657.22, Z1: 1025.88, Z DEM: 1025.83, Z LAS: 1025.75, ΔZ DEM: -0.05, ΔZ LAS: -0.13



North



South



East



West

# Point: 1043 Tall Weeds

Survey X: 858121.06, Survey Y: 498631.16, Z1: 1024.99, Z DEM: 1025.28, Z LAS: 1025.23, ΔZ DEM: 0.3, ΔZ LAS: 0.25



North



South



East



West

# Point: 1044 Bare Earth

Survey X: 858143.87, Survey Y: 498673.59, Z1: 1024.91, Z DEM: 1024.87, Z LAS: 1024.86, ΔZ DEM: -0.04, ΔZ LAS: -0.05



North



South



East



West

# Point: 1045 Forested

Survey X: 858033.67, Survey Y: 498634.6, Z1: 1021.07, Z DEM: 1021.39, Z LAS: 1021.43, ΔZ DEM: 0.32, ΔZ LAS: 0.36



North



South



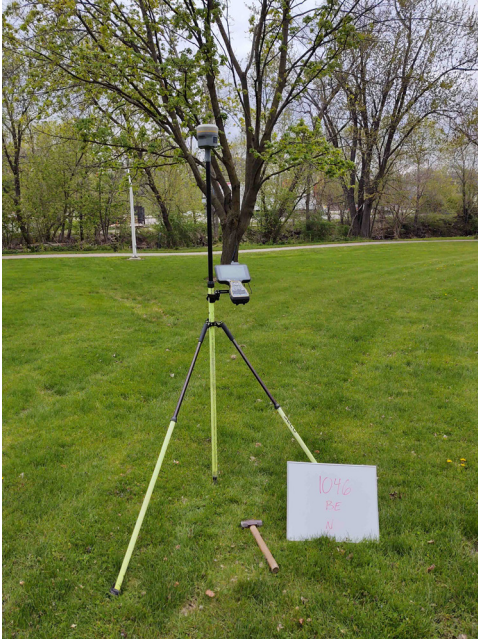
East



West

# Point: 1046 Bare Earth

Survey X: 881535.64, Survey Y: 479198.59, Z1: 878.39, Z DEM: 878.36, Z LAS: 878.29, ΔZ DEM: -0.04, ΔZ LAS: -0.11



North



South



East



West

## Point: 1047 Forested

Survey X: 881450.34, Survey Y: 479182.78, Z1: 878.14, Z DEM: 878.31, Z LAS: 878.37, ΔZ DEM: 0.17, ΔZ LAS: 0.23



North



South



East



West



## Point: 1048 Urban Area

Survey X: 883311.44, Survey Y: 479145.11, Z1: 966.38, Z DEM: 966.49, Z LAS: 966.43,  $\Delta Z$  DEM: 0.11,  $\Delta Z$  LAS: 0.05



North



South



East



West

# Point: 1049 Tall Weeds

Survey X: 883510.71, Survey Y: 477995.37, Z1: 957.93, Z DEM: 958.21, Z LAS: 958.18, ΔZ DEM: 0.28, ΔZ LAS: 0.25



North



South



East



West

# Point: 1050 Bare Earth

Survey X: 881956.17, Survey Y: 458165.67, Z1: 903.37, Z DEM: 903.25, Z LAS: 903.36, ΔZ DEM: -0.13, ΔZ LAS: -0.01



North



South



East



West

# Point: 1051 Tall Weeds

Survey X: 881971.92, Survey Y: 458383.91, Z1: 887.35, Z DEM: 887.51, Z LAS: 887.54, ΔZ DEM: 0.16, ΔZ LAS: 0.2



North



South



East



West

# Point: 1052 Forested

Survey X: 881832.31, Survey Y: 458242.54, Z1: 893.78, Z DEM: 893.88, Z LAS: 893.9, ΔZ DEM: 0.1, ΔZ LAS: 0.12



North



South



East



West

# Point: 1053 Urban Area

Survey X: 881742.82, Survey Y: 457820.08, Z1: 916.54, Z DEM: 916.45, Z LAS: 916.39, ΔZ DEM: -0.08, ΔZ LAS: -0.15



North



South



East



West

# Point: 1054 Urban Area

Survey X: 879986.62, Survey Y: 426071.73, Z1: 924.9, Z DEM: 924.85, Z LAS: 924.83, ΔZ DEM: -0.05, ΔZ LAS: -0.07



North



South



East



West

# Point: 1055 Tall Weeds

Survey X: 879902.38, Survey Y: 425961.97, Z1: 912.9, Z DEM: 913.35, Z LAS: 913.33, ΔZ DEM: 0.45, ΔZ LAS: 0.43



North



South



East



West



# Point: 1056 Bare Earth

Survey X: 894747.05, Survey Y: 406344.91, Z1: 880.76, Z DEM: 880.86, Z LAS: 880.87, ΔZ DEM: 0.1, ΔZ LAS: 0.11



North



South



East



West

# Point: 1057 Bare Earth

Survey X: 894521.44, Survey Y: 406443.7, Z1: 885.96, Z DEM: 886.07, Z LAS: 886.02, ΔZ DEM: 0.11, ΔZ LAS: 0.06



North



South



East



West

# Point: 1058 Forested

Survey X: 894815.39, Survey Y: 406479.47, Z1: 879.55, Z DEM: 879.76, Z LAS: 879.85, ΔZ DEM: 0.21, ΔZ LAS: 0.3



North



South



East



West

# Point: 1059 Bare Earth

Survey X: 892994, Survey Y: 399768.95, Z1: 937.13, Z DEM: 937.31, Z LAS: 937.33, ΔZ DEM: 0.17, ΔZ LAS: 0.2



North



South



East



West

# Point: 1060 Urban Area

Survey X: 893047.38, Survey Y: 399949.73, Z1: 938.04, Z DEM: 938.08, Z LAS: 938.1, ΔZ DEM: 0.03, ΔZ LAS: 0.06



North



South



East



West

## Point: 1061 Forested

Survey X: 893058.1, Survey Y: 399743.46, Z1: 936.62, Z DEM: 936.76, Z LAS: 936.75, ΔZ DEM: 0.14, ΔZ LAS: 0.13



North



South



East



West

# Point: 1062 Urban Area

Survey X: 865111.59, Survey Y: 405386.36, Z1: 982.06, Z DEM: 982.1, Z LAS: 982.05, ΔZ DEM: 0.04, ΔZ LAS: 0



North



South



East



West

# Point: 1063 Forested

Survey X: 864944.75, Survey Y: 405132.23, Z1: 971.89, Z DEM: 971.96, Z LAS: 971.93, ΔZ DEM: 0.07, ΔZ LAS: 0.04



North



South



East



West



# Point: 1064 Bare Earth

Survey X: 847355.25, Survey Y: 401113.49, Z1: 869.72, Z DEM: 869.83, Z LAS: 869.84, ΔZ DEM: 0.11, ΔZ LAS: 0.12



North



South



East



West

# Point: 1065 Urban Area

Survey X: 847429.36, Survey Y: 401094.31, Z1: 873.57, Z DEM: 873.6, Z LAS: 873.57, ΔZ DEM: 0.03, ΔZ LAS: 0.01



North



South



East



West

# Point: 1066 Tall Weeds

Survey X: 847199.95, Survey Y: 400984.68, Z1: 863.45, Z DEM: 863.68, Z LAS: 863.86,  $\Delta Z$  DEM: 0.23,  $\Delta Z$  LAS: 0.41



North



South



East



West

## Point: 1067 Forested

Survey X: 847139.02, Survey Y: 401048.49, Z1: 856.62, Z DEM: 856.72, Z LAS: 856.83,  $\Delta Z$  DEM: 0.11,  $\Delta Z$  LAS: 0.22



North



South



East



West

# Point: 1068 Urban Area

Survey X: 862900.5, Survey Y: 428906.18, Z1: 925.38, Z DEM: 925.32, Z LAS: 925.39, ΔZ DEM: -0.06, ΔZ LAS: 0.01



North



South



East



West

# Point: 1069 Tall Weeds

Survey X: 862911.53, Survey Y: 428801.06, Z1: 913.9, Z DEM: 914.7, Z LAS: 914.69,  $\Delta Z$  DEM: 0.8,  $\Delta Z$  LAS: 0.79



North



South



East



West

## Point: 1070 Bare Earth

Survey X: 862588.47, Survey Y: 428583.48, Z1: 920.96, Z DEM: 920.95, Z LAS: 920.92,  $\Delta Z$  DEM: -0.01,  $\Delta Z$  LAS: -0.04



North



South



East



West

# Point: 1071 Urban Area

Survey X: 859838.54, Survey Y: 454934.96, Z1: 639.54, Z DEM: 639.63, Z LAS: 639.61, ΔZ DEM: 0.09, ΔZ LAS: 0.07



North



South



East



West



# Point: 1072 Bare Earth

Survey X: 860483.24, Survey Y: 455019.43, Z1: 643.3, Z DEM: 643.41, Z LAS: 643.33, ΔZ DEM: 0.1, ΔZ LAS: 0.03



North



South



East



West

# Point: 1073 Urban Area

Survey X: 817784.32, Survey Y: 633275.97, Z1: 651.99, Z DEM: 651.96, Z LAS: 651.94, ΔZ DEM: -0.03, ΔZ LAS: -0.04



North



South



East



West

# Point: 1074 Bare Earth

Survey X: 817879.49, Survey Y: 633447.8, Z1: 660.38, Z DEM: 660.41, Z LAS: 660.45,  $\Delta Z$  DEM: 0.02,  $\Delta Z$  LAS: 0.07



North



South



East



West

# Point: 1075 Forested

Survey X: 817847.43, Survey Y: 633318.5, Z1: 651.01, Z DEM: 651.11, Z LAS: 651.1, ΔZ DEM: 0.11, ΔZ LAS: 0.1



North



South



East



West

# Point: 1076 Urban Area

Survey X: 817759.48, Survey Y: 633271.62, Z1: 651.7, Z DEM: 651.67, Z LAS: 651.69, ΔZ DEM: -0.03, ΔZ LAS: -0.01



North



South



East



West

## Point: 1077 Tall Weeds

Survey X: 816479.9, Survey Y: 623838.26, Z1: 685, Z DEM: 685.07, Z LAS: 685.06, ΔZ DEM: 0.07, ΔZ LAS: 0.06



North



South



East



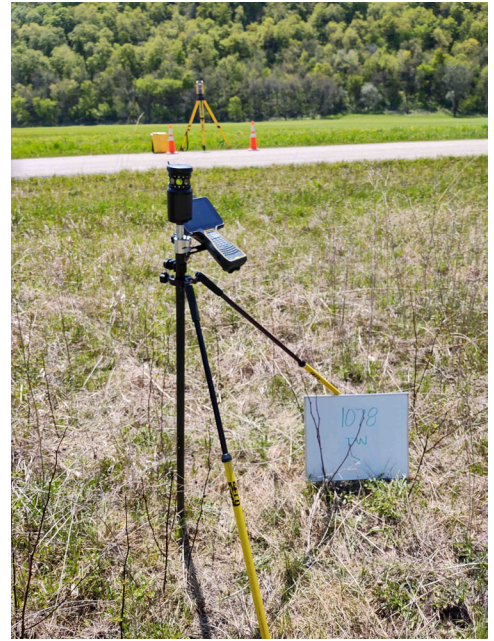
West

# Point: 1078 Tall Weeds

Survey X: 796529.31, Survey Y: 613279.61, Z1: 653.41, Z DEM: 653.69, Z LAS: 653.71, ΔZ DEM: 0.28, ΔZ LAS: 0.3



North



South



East



West

# Point: 1079 Forested

Survey X: 796463.11, Survey Y: 613370.98, Z1: 655.26, Z DEM: 655.4, Z LAS: 655.36, ΔZ DEM: 0.13, ΔZ LAS: 0.1



North



South



East



West



# Point: 1080 Urban Area

Survey X: 796532.88, Survey Y: 613240.29, Z1: 656.63, Z DEM: 656.64, Z LAS: 656.59,  $\Delta Z$  DEM: 0.01,  $\Delta Z$  LAS: -0.04



North



South



East



West

# Point: 1081 Urban Area

Survey X: 784322, Survey Y: 599439.19, Z1: 666.8, Z DEM: 666.78, Z LAS: 666.68, ΔZ DEM: -0.01, ΔZ LAS: -0.11



North



South



East



West

# Point: 1082 Bare Earth

Survey X: 784269.74, Survey Y: 599361.07, Z1: 656.51, Z DEM: 656.77, Z LAS: 656.76, ΔZ DEM: 0.26, ΔZ LAS: 0.26



North



South



East



West

## Point: 1083 Urban Area

Survey X: 789732.07, Survey Y: 569387.11, Z1: 1176.65, Z DEM: 1176.6, Z LAS: 1176.59,  $\Delta Z$  DEM: -0.05,  $\Delta Z$  LAS: -0.06



North



South



East



West

# Point: 1084 Bare Earth

Survey X: 789838.09, Survey Y: 569851.39, Z1: 1182.69, Z DEM: 1182.76, Z LAS: 1182.72, ΔZ DEM: 0.07, ΔZ LAS: 0.03



North



South



East



West

## Point: 1085 Tall Weeds

Survey X: 789719.43, Survey Y: 569743.76, Z1: 1175.09, Z DEM: 1175.48, Z LAS: 1175.52,  $\Delta Z$  DEM: 0.39,  $\Delta Z$  LAS: 0.43



North



South



East



West

# Point: 1086 Tall Weeds

Survey X: 799231.44, Survey Y: 553497.42, Z1: 980.66, Z DEM: 980.93, Z LAS: 980.79, ΔZ DEM: 0.27, ΔZ LAS: 0.13



North



South



East



West

# Point: 1087 Forested

Survey X: 799040.28, Survey Y: 554004.25, Z1: 1017.21, Z DEM: 1017.55, Z LAS: 1017.65,  $\Delta Z$  DEM: 0.34,  $\Delta Z$  LAS: 0.44



North



South



East



West



# Point: 1088 Urban Area

Survey X: 776755.65, Survey Y: 546013.64, Z1: 1081.92, Z DEM: 1082.06, Z LAS: 1082.04, ΔZ DEM: 0.14, ΔZ LAS: 0.12



North



South



East



West

# Point: 1089 Bare Earth

Survey X: 776118.67, Survey Y: 545928.15, Z1: 1097.44, Z DEM: 1097.51, Z LAS: 1097.55, ΔZ DEM: 0.07, ΔZ LAS: 0.11



North



South



East



West

# Point: 1090 Urban Area

Survey X: 761416.5, Survey Y: 537582.83, Z1: 983.22, Z DEM: 983.13, Z LAS: 983.11, ΔZ DEM: -0.09, ΔZ LAS: -0.11



North



South



East



West

# Point: 1091 Bare Earth

Survey X: 761398.44, Survey Y: 537487.76, Z1: 979.3, Z DEM: 979.29, Z LAS: 979.27, ΔZ DEM: 0, ΔZ LAS: -0.03



North



South



East



West

# Point: 1092 Bare Earth

Survey X: 814075.4, Survey Y: 457588.76, Z1: 614.41, Z DEM: 614.34, Z LAS: 614.36, ΔZ DEM: -0.07, ΔZ LAS: -0.06



North



South



East



West

# Point: 1093 Urban Area

Survey X: 814074.6, Survey Y: 457679.65, Z1: 618.33, Z DEM: 618.23, Z LAS: 618.12, ΔZ DEM: -0.1, ΔZ LAS: -0.21



North



South



East



West

# Point: 1094 Forested

Survey X: 813973.29, Survey Y: 457764.75, Z1: 618.63, Z DEM: 618.53, Z LAS: 618.57, ΔZ DEM: -0.1, ΔZ LAS: -0.06



North



South



East



West

# Point: 1095 Tall Weeds

Survey X: 814131.07, Survey Y: 457609.6, Z1: 613.46, Z DEM: 613.71, Z LAS: 613.81, ΔZ DEM: 0.25, ΔZ LAS: 0.35



North



South



East



West



# Point: 1096 Urban Area

Survey X: 790349.79, Survey Y: 476215.76, Z1: 660.28, Z DEM: 660.31, Z LAS: 660.29, ΔZ DEM: 0.03, ΔZ LAS: 0.01



North



South



East



West

# Point: 1097 Bare Earth

Survey X: 790415.75, Survey Y: 476203.54, Z1: 658.29, Z DEM: 658.37, Z LAS: 658.33, ΔZ DEM: 0.08, ΔZ LAS: 0.04



North



South



East



West

# Point: 1098 Bare Earth

Survey X: 789533.52, Survey Y: 475994.31, Z1: 723.68, Z DEM: 723.69, Z LAS: 723.54, ΔZ DEM: 0.01, ΔZ LAS: -0.15



North



South



East



West

# Point: 1099 Forested

Survey X: 789806.41, Survey Y: 476460.24, Z1: 715.85, Z DEM: 715.89, Z LAS: 716.26, ΔZ DEM: 0.05, ΔZ LAS: 0.41



North



South



East



West

# Point: 1100 Urban Area

Survey X: 747512.18, Survey Y: 472456.62, Z1: 616.31, Z DEM: 616.06, Z LAS: 616.12, ΔZ DEM: -0.25, ΔZ LAS: -0.19



North



South



East



West

# Point: 1101 Bare Earth

Survey X: 747387.16, Survey Y: 472497.29, Z1: 615.4, Z DEM: 615.19, Z LAS: 615.17, ΔZ DEM: -0.22, ΔZ LAS: -0.23



North



South



East



West

## Point: 1102 Tall Weeds

Survey X: 728471.86, Survey Y: 489085.67, Z1: 616.6, Z DEM: 616.66, Z LAS: 616.66, ΔZ DEM: 0.06, ΔZ LAS: 0.06



North



South



East



West

# Point: 1103 Forested

Survey X: 728312.9, Survey Y: 489295.86, Z1: 616.33, Z DEM: 616.38, Z LAS: 616.44, ΔZ DEM: 0.05, ΔZ LAS: 0.11



North



South



East



West



# Point: 1104 Urban Area

Survey X: 733319.96, Survey Y: 522279.87, Z1: 1030.99, Z DEM: 1031.1, Z LAS: 1031.05, ΔZ DEM: 0.11, ΔZ LAS: 0.06



North



South



East



West

# Point: 1105 Tall Weeds

Survey X: 733403.33, Survey Y: 522217.01, Z1: 1035.79, Z DEM: 1035.98, Z LAS: 1035.98, ΔZ DEM: 0.19, ΔZ LAS: 0.19



North



South



East



West

# Point: 1106 Bare Earth

Survey X: 733180.52, Survey Y: 522210.07, Z1: 1036.2, Z DEM: 1036.14, Z LAS: 1036.33, ΔZ DEM: -0.05, ΔZ LAS: 0.14



North



South



East



West

# Point: 1107 Forested

Survey X: 733136.98, Survey Y: 522296.56, Z1: 1029.8, Z DEM: 1029.84, Z LAS: 1029.93, ΔZ DEM: 0.04, ΔZ LAS: 0.13



North



South



East



West

# Point: 1108 Urban Area

Survey X: 714481.9, Survey Y: 543434.68, Z1: 626.9, Z DEM: 626.77, Z LAS: 626.72, ΔZ DEM: -0.13, ΔZ LAS: -0.18



North



South



East



West

# Point: 1109 Bare Earth

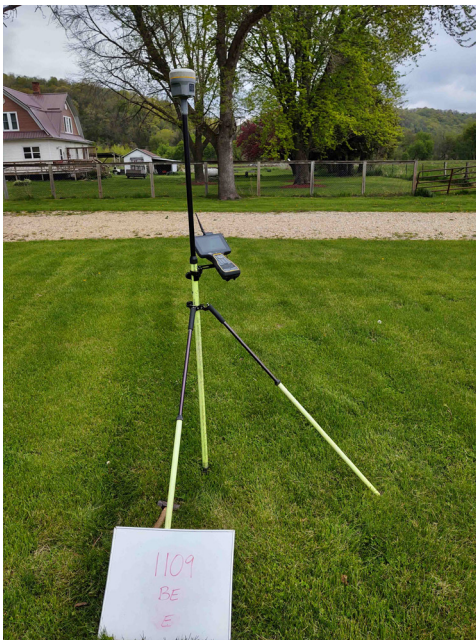
Survey X: 714677.15, Survey Y: 544219.82, Z1: 635.79, Z DEM: 635.69, Z LAS: 635.72,  $\Delta Z$  DEM: -0.1,  $\Delta Z$  LAS: -0.07



North



South



East



West

# Point: 1110 Tall Weeds

Survey X: 714788.9, Survey Y: 544016.14, Z1: 633.82, Z DEM: 633.85, Z LAS: 633.86, ΔZ DEM: 0.02, ΔZ LAS: 0.03



North



South



East



West

# Point: 1111 Forested

Survey X: 714754.48, Survey Y: 544216.24, Z1: 636.53, Z DEM: 636.44, Z LAS: 636.47, ΔZ DEM: -0.1, ΔZ LAS: -0.06



North



South



East



West



# Point: 1112 Urban Area

Survey X: 800538.98, Survey Y: 500554.9, Z1: 995.04, Z DEM: 995.05, Z LAS: 995.02, ΔZ DEM: 0.01, ΔZ LAS: -0.02



North



South



East



West

# Point: 1113 Bare Earth

Survey X: 800864.82, Survey Y: 500584.15, Z1: 992.23, Z DEM: 992.22, Z LAS: 992.24, ΔZ DEM: 0, ΔZ LAS: 0.02



North



South



East



West

# Point: 1114 Tall Weeds

Survey X: 800912.37, Survey Y: 500581.29, Z1: 990.64, Z DEM: 990.76, Z LAS: 990.68, ΔZ DEM: 0.12, ΔZ LAS: 0.05



North



South



East



West

# Point: 1115 Bare Earth

Survey X: 777363.69, Survey Y: 506098.11, Z1: 993.02, Z DEM: 993.11, Z LAS: 993.12, ΔZ DEM: 0.09, ΔZ LAS: 0.1



North



South



East



West

# Point: 1116 Tall Weeds

Survey X: 778206.51, Survey Y: 502861.06, Z1: 975.06, Z DEM: 975.65, Z LAS: 975.54, ΔZ DEM: 0.59, ΔZ LAS: 0.48



North



South



East



West

# Point: 1117 Bare Earth

Survey X: 750182.47, Survey Y: 512018.91, Z1: 875.28, Z DEM: 875.18, Z LAS: 875.14,  $\Delta Z$  DEM: -0.1,  $\Delta Z$  LAS: -0.14



North



South



East



West

# Point: 1118 Urban Area

Survey X: 755034.45, Survey Y: 519391.37, Z1: 1022.56, Z DEM: 1022.57, Z LAS: 1022.47, ΔZ DEM: 0.01, ΔZ LAS: -0.1



North



South



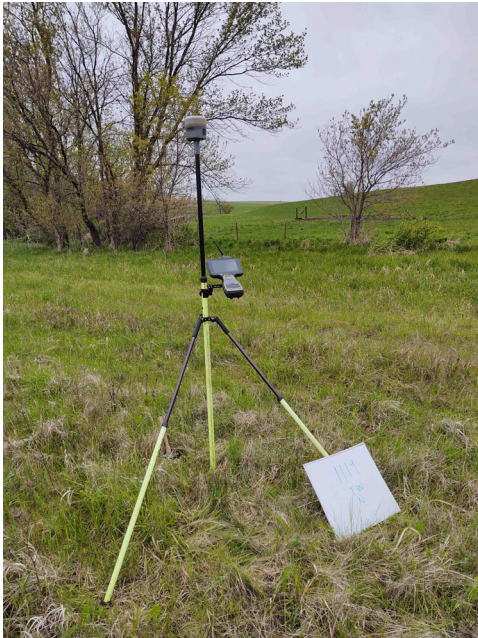
East



West

# Point: 1119 Tall Weeds

Survey X: 756991.97, Survey Y: 543781.1, Z1: 934.36, Z DEM: 934.59, Z LAS: 934.62, ΔZ DEM: 0.23, ΔZ LAS: 0.26



North



South



East



West



# Point: 1120 Forested

Survey X: 756970.7, Survey Y: 543853.79, Z1: 933.83, Z DEM: 934.04, Z LAS: 934.17, ΔZ DEM: 0.22, ΔZ LAS: 0.34



North



South



East



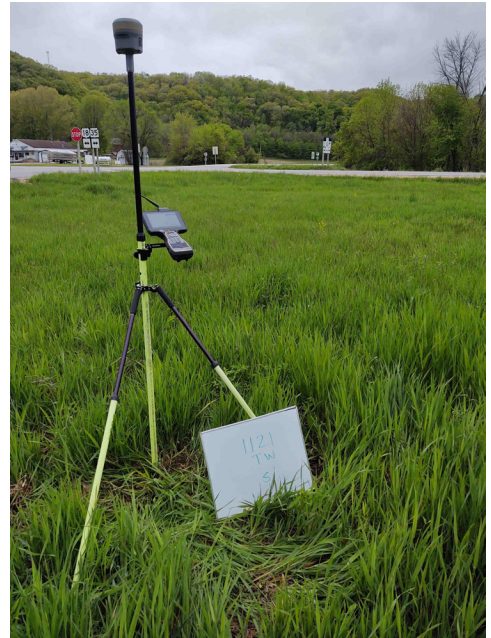
West

# Point: 1121 Tall Weeds

Survey X: 729024.81, Survey Y: 576780.08, Z1: 626.11, Z DEM: 626.27, Z LAS: 626.21, ΔZ DEM: 0.16, ΔZ LAS: 0.1



North



South



East



West

# Point: 1122 Urban Area

Survey X: 728977.73, Survey Y: 576644.88, Z1: 629.91, Z DEM: 629.86, Z LAS: 629.8, ΔZ DEM: -0.05, ΔZ LAS: -0.11



North



South



East



West

# Point: 1123 Forested

Survey X: 729079.89, Survey Y: 576867.84, Z1: 625.86, Z DEM: 626.02, Z LAS: 626.07, ΔZ DEM: 0.16, ΔZ LAS: 0.21



North



South



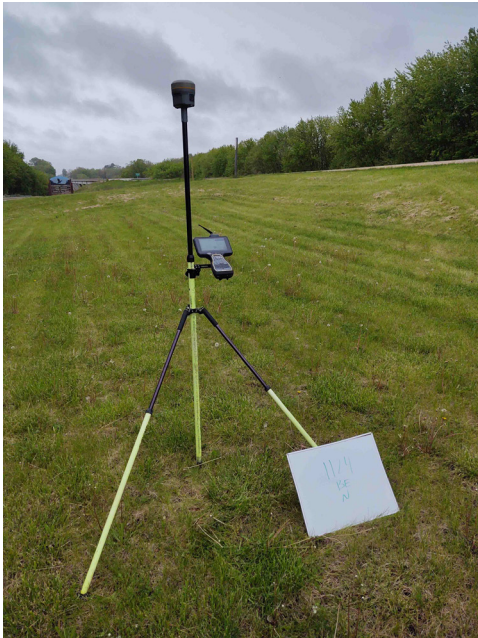
East



West

# Point: 1124 Bare Earth

Survey X: 728112.67, Survey Y: 578341.54, Z1: 628.04, Z DEM: 627.95, Z LAS: 627.97, ΔZ DEM: -0.08, ΔZ LAS: -0.07



North



South



East



West

# Point: 1125 Urban Area

Survey X: 727595.29, Survey Y: 579299.14, Z1: 622.55, Z DEM: 622.41, Z LAS: 622.43,  $\Delta Z$  DEM: -0.14,  $\Delta Z$  LAS: -0.12



North



South



East



West